

Financial Performance of the Armenian Power Sector

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1. INTRODUCTION

This memorandum concerns an analysis of the financial performance of the electric power sector of Armenia for 12 months of 2001. Analysis is based on data that PA Consulting received on May 13, 2001 from IDA. IDA received this data officially from the RA Ministry of Energy (MoE). PA Consulting has not received the Ministry's MOU report for 2001 year-end. PA Consulting understands that data provided by the MOE to IDA is based on legal reportings (financial statements) of the energy companies for 2001 and, accordingly, represents the official financial results of the sector for 2001. This, however, does not necessarily mean that 2001 data cannot be changed retroactively by the Ministry in the future. In this respect, PA Consulting has also updated analyses of the sector's performance in 1998-2000 based on the latest updates received from the Ministry.

Information on thermal energy purchases and sales was not reported officially to PA Consulting. For this reason, analysis of thermal energy operations is missing in this report. This report provides a discussion of only one aspect of the energy sector's performance, which is focused primarily on sector's electricity losses, income and collections. Information on sector's accrued fuel costs, O&M expenditures, capital costs, banks loans and GOA on-lent funds, tax payments, receivables and payables is not presented in this report.

In some instances, PA Consulting has found inconsistencies between the Ministry's and Armenergo's data on wholesale purchases and sales. In these cases PA Consulting has used MoE's figures to ensure the consistency of the analyzed data series of electricity purchases/sales and payments.

In some instance, the analysis presented in this memorandum employees different methodology than previous PA Consulting reports. These changes, which are the result of the differences between the MOU and IDA data formats, are fully explained in the report.

This analysis is provided for information purposes only. PA Consulting has not verified the accuracy, reliability or completeness of the MOE data. Accordingly, PA Consulting makes no representation or warranty as to the accuracy, reliability or completeness of any of the information contained in this memorandum, and PA's respective employees and consultants shall have no liability for any statements, opinions, information or matters (expressed or implied) contained in, arising of, or derived from, or for any omissions from, this memorandum.

2. PURPOSE OF THE ANALYSIS

The objectives of this report are to:

1. Review changes in electric power generation, exports and internal demand, as well as to identify trends in transmission and distribution losses.
2. Track changes in domestic electricity tariffs and export prices.
3. Review consolidated energy sector's income and collections from electricity sales.
4. Determine financial losses of the sector and to identify major drivers of these losses.
5. Review funds flows relating to intra-sector electricity purchases and sales transactions.

3. SUMMARY OF THE RESULTS

A brief outline of the results is followed by the appendices containing detailed statistical analyses of the MOE data.

1. Demand, generation and losses

- **Table 1 and Chart 1 in Appendix A indicate 3% decrease in 2001 bulk electricity supply to distribution (from 4,742 GWh in 2000 to 4,597 GWh in 2001), which is indicative of a continuing downward trend in Armenian domestic demand.**

PA Consulting has not analyzed impact of seasonality factors that might have contributed to the demand reduction in 1998-2001. In PA's opinion, however, 4-year downturn in the Armenian internal demand offers sufficient evidence to conclude that the reduction is a result of factors of a systematic nature. Among these are:

- Decrease in residential demand primarily due to continuing emigration and switchover to alternative energy sources (effect of gasification);
- Reduction of demand of quasi-fiscal consumers (irrigation, drinking water, and transportation);
- Change in the structure of the GDP and decrease of share of energy intensive industries. This may explain why Armenian GDP goes up while electric energy demand goes down.

Decrease of Armenian domestic electricity demand in 1998-2001 was not driven by the reduction of the losses.

- **Armenian net exports decreased from 463 GWh in 2000 to 371 GWh in 2001 due to reduced exports to Georgia.**

Iran: Table 2 in Appendix A indicates positive 2001 balance of Armenia-Iran power exchange for the first time since 1999 (37 GWh). Since 1998, Armenia realized substantial benefits from power exchange with Iran as it allowed Armenian energy sector to reduce its fuel cost. Also, electricity imports from Iran were critical to Armenia during the periods of natural gas cutoffs. For the reasons stated, in the previous years Armenia has accrued debts to Iran in form of electricity imports from Iran exceeding electricity exports from Armenia. As of January 1, 2002 Armenian debt to Iran for electricity imports plus Armenian share of construction cost of Agarak substation, which is being built jointly by Armenia and Iran, has amounted to 76 GWh. Armenia plans to fully repay this debt in 2002 by increased ANPP generation. According to 2002 energy balance projection, ANPP will send to grid 2,320 GWh compared to 1,814 GWh in 2001. This ambitious generation target may be achievable provided that ANPP refueling process will not adversely impact ANPP operation in 2002. Agarak substation will improve reliability of Armenian power system, but it will not necessarily lead to significant increase of Iran-Armenia power exchange in the future.

Georgia: In 1998-2001, Armenian exports to Georgia normally did not exceed 250 GWh per annum. Increase in exports in 2000 was a result of forced outage at Georgian

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hydroelectric power plants following the period of elections to the Georgian Parliament in October 2000.

Artsakh and Kashatagh: Net exports to Artsakh and Kashatagh in 1998-2001 remained at about 100 GWh per annum.

- **Armenia 2001 net generation decreased by 4% (from 5,567 GWh in 2000 to 5,342 GWh in 2001) primarily due to a contraction in Armenian domestic consumption (-145 GWh) and reduction in net exports (-92 GWh). Gas-fired generation in 2001 was the highest for the last 4 years, which resulted in substantial financial losses for the energy sector.**

Analysis of net generation is summarized in Table 3 and Chart 2 in Appendix A.

Two factors influenced the structure of Armenia electricity generation in 2001 and resulted in high share of marginal thermal generation (48% in 2001 compared to 45% in 2000):

- Extended outage of the Armenian nuclear power plant from July 10 to November 15 due insufficient funds in the energy sector to pay for the nuclear fuel. In 2001, nuclear fuel procurement process was changed and the responsibility was shifted from the Ministry of Finance to the Ministry of Energy.
- Low generation at Vorotan HPP. The primary reason was insufficient stock of water in reservoirs due to lower than normal precipitation during several consecutive years.

As a result of high share of gas-fired generation, and because fuel expense to produce 1 KWh at Hrazdan TPP is about 4 times as high as fuel expense to generation 1 KWh at ANPP, Armenian energy sector incurred large financial losses in 2001 of about 10 mln. dollars.

No significant changes were observed in auxiliary consumption of the power plants. On the contrary, economic needs of the power plants increased significantly from 24 GWh in 2000 to 44 GWh in 2001 due to extended ANPP outage in 2001.

- **Total T&D losses as percent of input to Armenergo increased from 25.6% in 2000 to 26.3% in 2001 primarily due to excess losses increase in the Central EDC.**

Analysis of losses is presented in Tables 4-7 in Appendix A.

No significant changes in transmission losses were observed in 2001 (5.8%) as compared to 2000 (5.7%). On the other hand, distribution losses grew from 19.9% in 2000 to 20.5% in 2001 as percent of input to Armenergo, which translates into 24.8% and 25.3% as percent of bulk electricity supply to distribution, respectively. Increase of distribution losses in 2001 was a result of growth of excess line losses, because technical distribution losses remained unchanged at 11.6% in 2000 and 2001. In turn, higher excess distribution losses in 2001 were driven by increased excess line losses in the Central EDC. All other EDCs managed to reduce their excess line losses in 2001.

Transmission losses remained virtually unchanged during 1998-2001 at approximately 6% of input to Armenergo. On the contrary, distribution losses were continuously increasing in 1999-2000 due to technical and excess losses growth. In 1998-2001, Yerevan and Central EDCs were consistently ranked among the worst performing

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companies in terms of excess line losses (almost 18%), while Northern and Southern EDCs managed to reduce the losses to 6-9% during 1998-2001.

Most experts agree that excess line losses in distribution are driven by theft in residential, industrial and services sectors in the proportion 60:10:30. In residential sector, significant portion of the energy that is not accounted for, is paid by consumers at a discount directly to meter readers, thus bypassing a distribution company. Some commercial consumers pay (sometimes without a discount) directly to meter reader as a recourse to hide energy consumption from tax authorities. Moreover, most experts agree that some portion of theft energy is hidden (embedded) within the technical losses. Based on the reasons stated, there are enough reasons to expect that large share of existing excess line losses in distribution will convert into the metered final consumption, provided that necessary financial controls are implemented in the EDCs through a management contract or outright share sale. Also, PA Consulting anticipates some reduction in transmission losses in 2002 as a result of DAS launch in November 2001. In 2002, the split between distribution and transmission losses in total T&D losses will change as a result of transfer of 110KV substations from High-Voltage Network to Armetnet in spring 2002.

- **In 2001 metered final consumption continued to decline. In 2001 it fell by almost 4% (from 3,566 GWh in 2000 to 3,436 GWh in 2001). This is the lowest consumption figure observed in Armenia in the last 4 years.**

Analysis of final metered consumption can be found in Tables 8-10 in Appendix A.

Most experts agree that data on allocation of final metered consumption by customer groups is probably the most manipulated at the EDC level and, therefore, is the least reliable. In some instances metered kilowatthours of residential, industrial and “other” customers are illegally shifted to budgetary and quasifiscal consumers. In this respect, PA Consulting conclusions derived from this data should be used with discretion.

In 2001, decline of metered final consumption was driven primarily by reduction of metered energy use in the water sector (irrigation –83 GWh, drinking water –32 GWh) and continuing reduction of residential consumption (-48 GWh). PA Consulting is not aware of the exact reasons that caused reduction of energy consumption in the water sector. Continuing reduction in residential consumption may a result of emigration of Armenian population and switchover to alternative energy sources. Exact reasons that have caused reduction in residential consumption are unknown. Consumption of “other” customer group does not follow any meaningful pattern, which may be indicative of data manipulation at the EDC level. Also, it is worthwhile to mention a slowdown in growth of industrial electric energy use. This can be a result of decreasing share of energy intensive industries in the Armenian GDP. It is important to mention growing excess line losses in distribution as one of the reasons that has contributed to decrease of metered final consumption in 2001. As follows from Table 1 in Appendix A, metered final consumption decreased by 4%, while real final consumption (metered consumption plus excess line losses) reduced only by 3%.

2. Tariffs

Tariff analysis in this report is focused primarily on tracking changes in retail tariffs and export prices because these tariffs determine the energy sector’s consolidated income. Analysis of

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intra-sector tariffs is provided for reference only. Absence of formal settlements and funds administration procedures in the sector makes the discussion of intra-sector tariffs meaningless.

- **Table 11 in Appendix B indicates a reduction of Armenia weighted average retail tariff for the third consecutive year since 1999.**

In 2001, average retail tariff reduced to 21.1 dram/KWh, which is almost 1 dram lower than in 1999. Because Armenian Regulator did not change retail tariffs since 1999 (see Table 12 in Appendix B), two factors prevailed in contributing to the overall reduction of average retail tariff in 2001: (i) continued decrease of residential demand; and (ii) large reduction of average tariff of “other” customer group. Most experts agree though that such a significant reduction of “other” customer group tariff is a result of data manipulation in the EDCs. It is worth mentioning that average retail tariff reduction by 1 dram translates into about \$6 mln. reduction of energy sector’s accrued income.

- **Average bulk supply tariff slightly reduced from 13.8 dram/KWh in 2000 to 13.5 dram/KWh in 2001. Average distribution tariff margin did not change in 2001 and remained at 7.6 dram/KWh. The cross subsidies between the EDCs’ bulk supply tariffs were even more pronounced in 2001 than in 2000.**

From the historic perspective, the most significant reduction of average bulk supply tariff (by 1 dram) occurred in 2000 as a result of the Armenian Regulator’s effort to increase attractiveness of the distribution companies to the strategic investors by reducing the EDCs’ bulk supply tariffs and increasing their tariff margins. Since 1998, the bulk-supply tariff for Yerevan EDC has been continuously increasing and amounted to 15.8 dram/KWh in 2000 and 16.2 dram/KWh in 2001, which is the highest tariff among all the EDCs. At the same time, for Central, Southern and Northern EDCs the bulk supply tariffs were constantly decreasing during 1998-2001. Northern EDC bulk supply tariff experienced reduction from 14.6 dram/KWh in 1999 to 10.2 dram/KWh in 2000 and 8.4 dram/KWh in 2001, which is the lowest tariff among all the EDCs and is twice as low as the tariff of Yerevan EDC. However, consolidation of the 4 EDCs into Armelnet in March 2002 makes useless any further analysis of cross-subsidization between the EDCs.

- **Average generation tariff remained virtually unchanged (slight increase from 12.1 dram/KWh in 2000 to 12.5 dram/KWh in 2001).**

On December 29, 2000, Armenian Regulator approved Resolution No. 31 on 2-part tariffs for generators for 2001. Starting February 1, 2001 the settlements for generators are performed based on the two-part tariffs. Average generation tariff did not virtually change in 2001 (12.5 dram/KWh) compared to 2000 (12.1 dram/KWh). PA Consulting did not analyze the exact reasons that caused this effect. Explanation that is suggested below requires further analysis and clarification. Historically, O&M expenses in Armenia generation tariffs do not change. The prevailing factor that determines Armenian generation tariffs is generation of the nuclear power plant. Nuclear power plant outage was 87 days in 1999 (11 September - 7 December), 125 days in 2000 (29 July - 1 December, safety upgrades, 2037 GWh planned gross generation) and 128 days in 2001 (10 July- 15 November, delay in fuel procurement, 2500 GWh planned gross generation). Since nuclear power plant’s generation was almost the same in 2001 and 2000, it had no significant impact on average generation tariff. It is worth noting a continuing increase of tariffs of both hydroelectric cascades by the ERC.

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- **Armenergo indebtedness continues to grow due to an inadequate tariff framework on the wholesale market.**

Armenergo and High-Voltage Network margin reduced from 1.7 dram/KWh in 2000 to 1.0 dram/KWh in 2001 as a result of two overlapping factors - increase in average generation tariff and reduction of average bulk supply tariff.

- **Export electricity prices and average tariff for electricity consumption for economic needs of the power plants did not change.**

Electricity sold to Georgia was priced at 2.5 dram/KWh in 1998-2001 (2.9 dram/KWh in 1999 is probably a typo in the Ministry's data form). It is worth mentioning that selling price of 2.5 dram/KWh may not be sufficient to recover fuel cost at Hrazdan TPP. However, this opinion needs further analysis. Electricity sold to Artsakh and Kashatagh was priced at 7.0 dram/KWh in 1998-2001. The issues of VAT reimbursement from the State for electricity exports and tax implications of Iranian electricity imports need further analysis and clarification. Average tariff for electricity consumption for economic needs of the power plants slightly reduced from 15.9 dram/KWh in 2000 to 15.3 dram/KWh in 2001. Normally, this tariff does not exceed 16 dram/KWh, which equals 35KV tariff.

3. Income and collections

Information provided in the MoE's "Generated and delivered electricity" data form is not sufficient for energy sector's funds flow analysis. Many items necessary for funds flow analysis, such as accrued costs, changes in inventory, uses of collected funds, changes in accounts receivable and payable cannot be derived from the Ministry's data form. Accordingly, most attention in this report was paid to review trends in sector's consolidated collections on the Armenian domestic market.

The Ministry did not provide information regarding the types of payment instruments referable to the reported figures on collections. The Ministry informally stated that no barter payments currently exist in the sector. As for offsets, Armenian legislation prohibits tax offsets against the consumption of fiscal and quasi-fiscal consumers in excess of funds that these consumers have available to pay for electric consumption (internally generated funds and GOA subsidies for quasi-fiscal sector, funds allocated in the State and local budgets for budgetary organizations). Accordingly, the Ministry claims that almost all payments for electric energy are currently made in cash. PA Consulting does not have enough information to verify this statement.

Since no formal funds administration procedures exist in the energy sector and because current process of intra-sector funds allocation remains arbitrary and unreliable, not much attention was paid internal sector's payment for electricity purchases and sales.

Analysis of income and collections is presented in Tables 13-18 in Appendix C. The following highlights the most important conclusions of the analysis.

- **Energy sector's accrued income continues to reduce for the 3rd consecutive year as a result of shrinking domestic demand, lower average retail tariff and high excess losses. Energy sector performed much worse in 2001 in terms of collections for domestic electricity sales compared to the previous year (81% versus 89%, respectively).**

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In 2001 sector's accrued income from domestic electricity sales reduced by 4 billion drams (7.4 mln. dollars) to 72 bln. drams. (130 mln. dollars). This was a result of contraction of final metered consumption and lower average retail tariff in 2001.

Ministry's 2001 report indicates the worst performing sector's collections from domestic electricity sales since 1999 (Table 13, Appendix C). Energy sector's consolidated collections from electricity retail sales reduced from 68 bln. drams in 2000 to 58 bln. drams in 2001, which translates into 89% and 81% of accrued income, respectively.

- **Low collections in 2001 were driven primarily by non-payments from the water sector, which were the lowest for the last 3 years. Payments from residential consumers did not substantially improve. Payments from industrial consumers reduced due to non-payment from Nairit. Payment from "other" consumers improved.**

Domestic retail consumers can be classified into two groups. The first group includes fiscal and quasi-fiscal consumers. Payments from these consumers are beyond the MoE's control because the Ministry will not dare to disconnect them for non-payment. The second group consists of residential, industrial and "other" consumers. The Ministry is able to directly control payments from these consumers by disconnecting them for non-payment. In this respect, this analysis is more concerned with tracking changes in payments from residential, industrial and "other" consumers, because it provides a clear measurement of Ministry's input in improving energy sector's performance.

Historically, payments from irrigation and potable water sectors depend on the subsidies that these sectors receive from the GOA. These subsidies vary from year to year, which explains a very volatile history of payments from the water sector. In 2000, irrigation paid almost 150% of its 2000 bill, and repaid some of its overdue payables for electricity. In 2001, however, irrigation paid only 52% of its 2001 bill due to insufficient funds (subsidies) to pay for electric energy (Table 14, Appendix C). Drinking water sector is consistently ranked amongst the largest non-payers for electric energy. In 2001 the drinking water sector performed even worse than in 2000 (27% versus 43%, respectively). PA Consulting is not aware of the exact reasons that caused poor performance of the water sector in 2001. Payments from budgetary organizations historically remain at about 75%. A stable payment history is a result of tax offsets used as a payment for electricity by budgetary organizations. Non-payments from budgetary organizations stem primarily from their excess consumption, which is not paid for by the State and local budgets. Some experts argue that quotas that are currently used to calculate electricity consumption of the budgetary organizations are not realistic because they were determined in the Soviet times when Armenia possessed a DH system. PA Consulting has not analyzed quotas and cannot verify this statement. Payments from transportation sector (metro, railroad and urban electrified transportation) remain at about 95% as a result of continuing cash injections from the GoA.

Payments from residential consumers in 2001 increased by only 4%, and amounted to 85% in 2001. From informal discussions with the Ministry, it looks there is no much hope for break through in improving payments from residential consumers in the next couple of years before presidential and parliamentary elections in Armenia. Historically, energy sector's collections from industrial consumers depend primarily on payments from copper-molybdenum factories and Nairit 1-2. Payments from industrial consumers reduced from 93% in 2000 to 82% in 2001 as a result of non-payment from Nairit 1-2. The Ministry

plans to increase payments from industrial sector to 100% in 2003 and also collect some overdue receivables. These plans may look too ambitious given the poor payment performance of Nairit factory. This may change though if privatization of Nairit factory is successful. Payments from “other” consumers increased from 96% in 2000 to 120% in 2001. PA Consulting is not aware of the exact reasons that caused such an increase. This, however, may be a result of data manipulation in the EDCs. Most experts agree that retail data, especially on “other” consumers, is the most manipulated in the EDCs.

From the perspective of the EDCs’ performance, Northern EDC had the highest retail collections (92%), while Central EDC had the lowest collections (67%). However, due to differing structure of residential demand in the EDCs’ no definitive conclusions can be made regarding the EDCs’ management input in improving collections (Table 15, Appendix C).

- **Collections for electricity exports to Georgia and Artsakh were about 100% in 2001.**

Collections for electricity exports to Georgia substantially improved during the last several years. Georgia paid more than 100% in 2001, thus repaying previous electricity debts to Armenia. On the contrary, payments from Artsakh in 2001 were very low (42%). Overall, Armenia energy sector’s net income for electricity exports to Georgia and Artsakh amounted to almost 4 bln. drams (7 mln. dollars), which is about 100% of export accrued income (Table 13, Appendix C).

- **Armenergo retained larger than normal margin in 2001, presumably to repay bank loans that became due in 2001. Payments to generators were the lowest for the last 4 years.**

The most significant change in 2001 funds flow was larger cash margin retained by Armenergo (11 bln. drams, or 20 mln. dollars). At the same time, Armenergo’s 2001 margin on an accrual basis was negative due to higher than normal gas-fired generation in 2001 (Table 16, Appendix C). Larger cash margin of Armenergo was retained at an expense of lower payments to generators (34 bln. drams, 62 mln. dollars), which is almost 13 bln. drams less than in the previous year. Less margin retained by the EDCs also contributed to larger Armenergo margin in 2001. PA Consulting does not possess enough information to suggest exact explanations for such changes in the funds flows. One of the reasons for larger Armenergo margin could be repayment of commercial bank loans that became due in 2001, or changes in fuel procurement process.

- **Energy sector’s cash-flow shortfall from current operations is estimated at about 50 mln. dollars in 2001.**

According to PA Consulting sources, total operating expenses of Armenian energy sector were about 90 bln. drams (8 bln. drams nuclear fuel, 39 bln. drams for natural gas deliveries, 14 bln. salary and social security, 7 bln. materials and supplies, 12 bln. drams maintenance expense, 10 bln. drams in accrued tax payments). This figure does not include such items as repayment and servicing of bank loans and GOA on-lent funds, repayment of tax payables and debts to suppliers and contractors, and investment costs. On the other hand, Armenian energy sector operating income on a cash basis did not exceed 63 bln. drams (58 bln. drams collections from domestic electricity sales, 4 bln. drams export proceeds, and about 1 bln. drams collections from thermal energy sales).

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Thus, financing gap of the Armenian energy sector from current operations can be estimated at about 27 bln. drams in 2001 (about 50 mln. dollars).

4. Financial losses

In this report, the financial losses are determined as energy sector's income lost due to excess line losses and non-payment from domestic retail electricity consumers. The definition of the financial losses in this report does not, however, include sector's operating, financial and investment expenditures. It neither includes sector's thermal energy operations and electricity exports. Notwithstanding the fact that the energy sector was eligible to pay VAT on a cash basis in 1998-2001, the VAT on an accrual basis that was not collected by the sector is considered in this report as the sector's financial loss as non-collected VAT is recognized as the sector's deferred tax liability.

- **The energy sector's financial losses arising from non-payment and excess line losses increased by almost 10 mln. dollars in 2001. The sector is loosing about 1 mln. dollars per week as a result of poor distribution operations (non-payments and excess line losses).**

Despite a modest increase in dram/dollar exchange rate from 540 in 2000 to 550 dram/dollar in 2001, the dollar amount of the energy sector's financial losses increased by almost 10 mln. dollars in 2001 and amounted to 49 mln. dollar. In relative terms, the energy sector's 2001 performance is even worse: financial losses increased from 24% of sector's potential revenues in 2000 to about 32% in 2001 (Table 19 in Appendix D).

- **Increase in sector's financial losses was driven by non-payment from retail electricity consumers. Each per cent of excess line losses costs about \$2 mln. to the energy sector; 1% of non-payments translates into \$1.3 mln. of sector's financial losses in dollar terms.**

Increase of the financial losses in 2001 was driven purely by larger non-payment from retail consumers that increased from 15 mln. dollars in 2000 to 25 mln. dollars in 2001. Financial losses arising from excess line losses in distribution remained at about 25 mln. dollars in 2001 and did not contribute to overall sector's financial losses increase in 2001.

APPENDIX A: DEMAND, GENERATION AND LOSSES
Table 1. Armenian consolidated energy balance, GWh

Formula	Item	1998	1999	2000	2001
1	Metered final consumption	3,597	3,628	3,566	3,436
	Percent (year-on-year)		1%	-2%	-4%
2	Excess losses in distribution	890	587	628	629
	Percent (year-on-year)		-34%	7%	0%
3=1+2	Real final consumption	4,487	4,215	4,194	4,065
	Percent (year-on-year)		-6%	0%	-3%
4	Normative losses in distribution	551	504	548	532
	Percent (year-on-year)		-9%	9%	-3%
5=3+4	Bulk supply to distribution	5,038	4,719	4,742	4,597
	Percent (year-on-year)		-6%	0%	-3%
6	Transmission losses	351	340	338	331
	Percent (year-on-year)		-3%	0%	-2%
7	Net exports	359	241	463	371
	Percent (year-on-year)		-33%	92%	-20%
8=5+6+7 +EN ¹	Net generation	5,763	5,316	5,567	5,342
	Percent (year-on-year)		-8%	5%	-4%
9	Auxiliary consumption of the power plants	428	400	391	392
	Percent (year-on-year)		-7%	-2%	0%
10=8+9	Gross generation	6,191	5,716	5,958	5,733
	Percent (year-on-year)		-8%	4%	-4%
11	System peak, MW		1,071	1,154	1,073
	Percent (year-on-year)			8%	-7%
12	GDP (in bln. dram 1996)		757.5	803.0	855.3
	Percent (year-on-year)			6%	7%

¹ EN = economic needs of the power plants. Equals 14 GWh (1998), 16 (1999), 24 (2000), 44 (2001).

Chart 1. Armenian energy balance, GWh

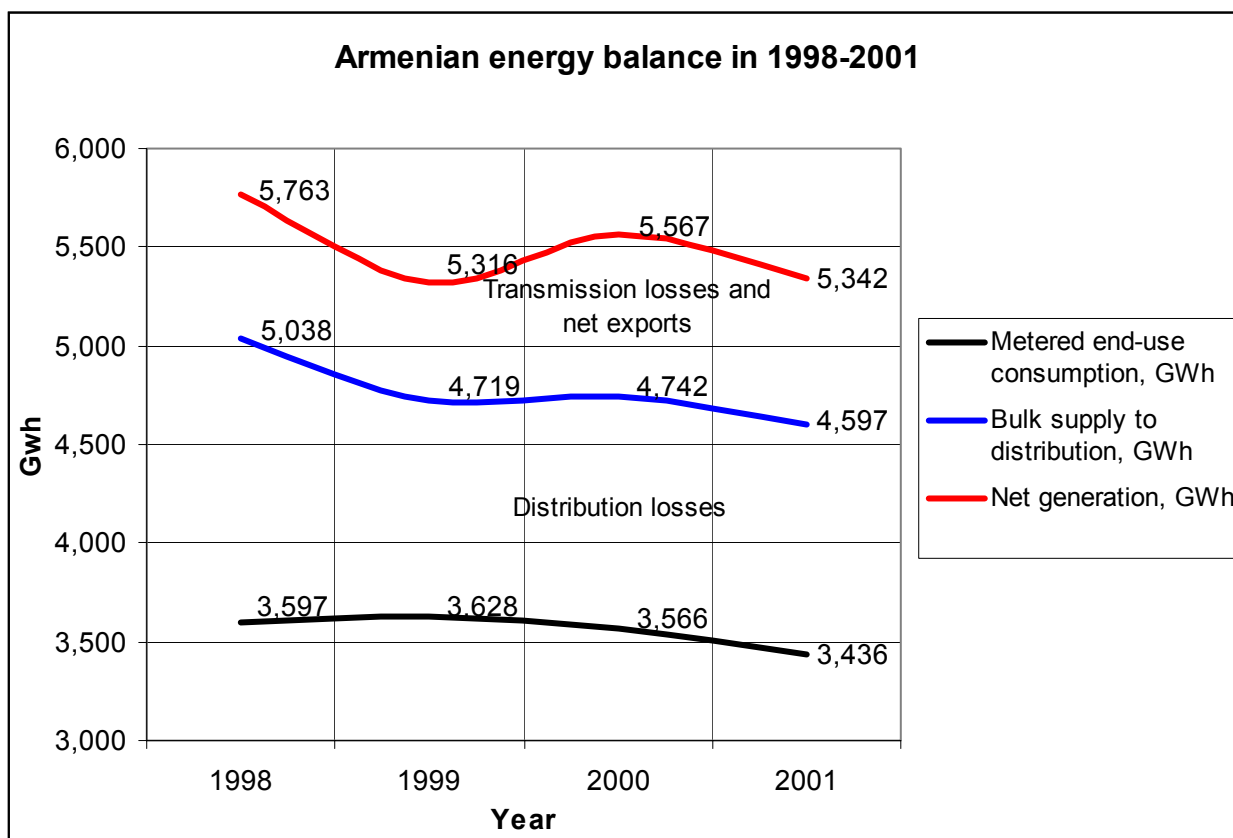


Table 2. Structure of net exports, GWh

	1998	1999	2000	2001
Inflow from Iran	27	457	347	318
Inflow to Iran	104	370	326	355
Export to Georgia	164	244	372	232
Net export to Artsakh and Kashatagh	118	84	112	102
Import from Artsakh	1	5	5	13
Export to Artsakh and Kashatagh	119	89	117	115
Net export (total)	359	241	463	371

Table 3. Structure of Armenian net generation, GWh

	1998	1999	2000	2001
ANPP	1,422	1,890	1,837	1,814
Hrazdan TPP	2,245	1,821	2,120	2,325
Yerevan CHP	569	416	360	244
Sevan-Hrazdan HPP	470	342	367	304
Vorotan HPP	949	724	778	527
Dzora HPP	59	66	50	54
Small HPPs	50	58	55	73
Total net generation	5,763	5,316	5,567	5,342

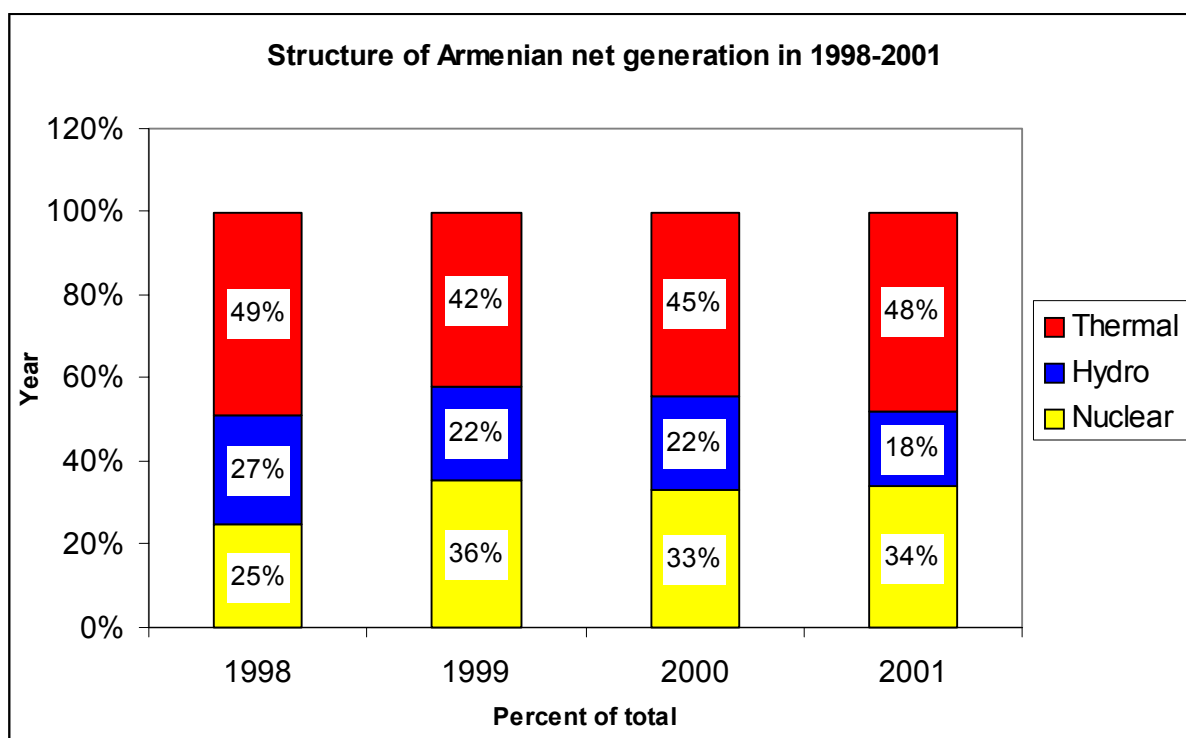
Chart 2. Structure of Armenian net generation, %

Table 4. Transmission and distribution losses, %

	1998	1999	2000	2001
Total T&D losses as per cent of input to Armenergo	31.0%	24.8%	25.6%	26.3%
Transmission losses as per cent of input to Armenergo	6.1%	5.9%	5.7%	5.8%
Distribution losses as per cent of input to Armenergo	24.9%	18.9%	19.9%	20.5%
Technical T&D losses as per cent of input to Armenergo	15.6%	14.6%	15.0%	15.2%
Excess T&D losses as per cent of input to Armenergo	15.4%	10.2%	10.6%	11.1%
Distribution losses as per cent of bulk electricity supply to distribution grid	28.6%	23.1%	24.8%	25.3%
Technical distribution losses as per cent of bulk supply to distribution grid	10.9%	10.7%	11.6%	11.6%
Non-technical distribution losses as per cent of bulk supply to distribution grid	17.7%	12.4%	13.3%	13.7%

Table 5. Total distribution losses by EDC

	1998	1999	2000	2001
Yerevan EDC	27.6%	23.8%	28.6%	27.8%
Southern EDC	18.7%	13.2%	14.5%	13.5%
Central EDC	35.1%	26.7%	27.6%	32.7%
Northern EDC	35.4%	31.8%	26.7%	24.9%
Total	28.6%	23.1%	24.8%	25.3%

Table 6. Technical distribution losses by EDC

	1998	1999	2000	2001
Yerevan EDC	11.1%	10.6%	10.1%	10.6%
Southern EDC	8.0%	7.3%	7.8%	7.5%
Central EDC	12.3%	12.8%	15.2%	14.9%
Northern EDC	12.7%	12.8%	16.2%	16.3%
Total	10.9%	10.7%	11.6%	11.6%

Table 7. Non-technical distribution losses by EDC

	1998	1999	2000	2001
Yerevan EDC	16.5%	13.2%	18.5%	17.2%
Southern EDC	10.7%	5.9%	6.7%	6.0%
Central EDC	22.9%	13.9%	12.5%	17.8%
Northern EDC	22.7%	19.0%	10.5%	8.5%
Total	17.7%	12.4%	13.3%	13.7%

Table 8. Structure of final metered consumption, GWh

	1998	1999	2000	2001
Residential	1,454	1,279	1,234	1,186
Industrial	638	673	696	709
Transportation	151	134	123	120
Irrigation	342	456	475	391
Drinking water	309	339	323	291
Budgetary organizations	241	229	235	232
Other consumers	461	518	479	506
Total final metered consumption	3,597	3,628	3,566	3,436

Table 9. Change in final metered consumption, %

	1998	1999	2000	2001
Residential		-175	-45	-48
Industrial		35	23	12
Transportation		-18	-10	-3
Irrigation		114	19	-83
Drinking water		30	-16	-32
Budgetary organization		-11	5	-3
Other consumers		56	-38	27
Total		32	-63	-130

Table 10. Structure of final metered consumption, %

	1998	1999	2000	2001
Residential	40.4%	35.3%	34.6%	34.5%
Industrial	17.7%	18.6%	19.5%	20.6%
Transportation	4.2%	3.7%	3.5%	3.5%
Irrigation	9.5%	12.6%	13.3%	11.4%
Drinking water	8.6%	9.4%	9.1%	8.5%
Budgetary organization	6.7%	6.3%	6.6%	6.8%
Other consumers	12.8%	14.3%	13.4%	14.7%
Total	100.0%	100.0%	100.0%	100.0%

APPENDIX B: TARIFFS
Table 11. Average domestic retail tariffs and export prices

	1998	1999	2000	2001
Weighted average retail tariff, Dram/KWh (incl. VAT)	20.3	21.9	21.5	21.1
Residential	19.2	24.9	24.9	24.8
Industrial	19.3	18.4	17.5	17.5
Transportation	18.4	16.7	17.0	16.8
Irrigation	20.7	20.6	20.7	20.2
Drinking water	20.6	18.9	18.6	18.4
Budgetary organizations	24.4	24.7	24.3	24.1
Other consumers	22.9	21.9	20.9	19.2
Average distribution tariff margin, dram/KWh (incl VAT)	5.4	6.9	7.7	7.6
Weighted average bulk supply tariff, dram/KWh (incl. VAT)	14.8	14.9	13.8	13.5
Yerevan EDC	15.1	15.6	15.8	16.2
Southern EDC	15.0	14.4	13.8	12.7
Central EDC	14.8	14.4	12.3	12.2
Northern EDC	13.9	14.6	10.2	8.4
Armenergo and Transco tariff margin for domestic electricity sales, dram/KWh (incl. VAT)	4.0	2.0	1.7	1.0
Weighted average generation tariff, dram/KWh (incl. VAT)	10.9	12.9	12.1	12.5
ANPP	11.0	12.7	10.5	10.5
Hrazdan TPP	15.4	17.8	17.3	16.4
Yerevan CHP	16.0	19.2	19.1	20.5
Sevan-Hrazdan HPP	3.3	4.4	5.4	6.6
Vorotan HPP	0.8	1.9	2.7	3.4
Dzora HPP	3.8	4.0	0.0	0.0
Small HPPs	13.6	13.7	11.5	10.8
Price of electricity exports to Georgia, cent/KWh (VAT n/a)	2.6	2.9	2.5	2.5
Price of electricity exports to Artsakh and Kashatagh, dram/KWh (VAT n/a)	7.0	7.1	7.0	7.0
Tariff for economic needs of the power plants, dram/KWh (incl. VAT)	15.3	16.0	15.9	15.3

Table 12. ERC-approved tariffs

	1998	1999	2000	2001
Residential, dram/KWh (incl. VAT)				
35KV	16	16	16	16
6/10KV direct	20	20	20	20
6/10KV nondirect	25	25	25	25
0.4KV	15 (<100 KWh/m); 22 (100-250 KWh/m); 25 (>250 KWh/m)	25	25	25
Bulk supply to EDCs, dram/KWh (incl. VAT)				
Yerevan EDC	In 1998 there were 12 local EDCs	16.446/14.512	16.026	16.225
Central EDC	-	15.175/13.261	12.153	12.178
Northern EDC	-	15.423/13.312	9.841	8.166
Southern EDC	-	15.287/13.164	13.820	12.635
Transmission tariff, dram/KWh (incl. VAT)	Transmission company was part of Armenergo	1.18	1.09	1.069
Generation, dram/KWh (incl. VAT)				
ANPP	12.37	13.68/10.08	10.527	9.341
Hrazdan TPP	15.48	18.35	17.503	17.751
Yerevan CHP	16.26	20.01	18.967	18.967
Sevan-Hrazdan Cascade	4.21	4.4	5.472	6.299
Vorotan Cascade	1.37	2.52	2.848	3.004

APPENDIX C: PAYMENTS AND COLLECTIONS

Table 13. Energy sector consolidated accrued income, collections, and intra-sector payments, mln. dram (incl. VAT)

	1998			1999			2000			2001		
	Income	Collect	%	Income	Collect	%	Income	Collect	%	Income	Collect	%
Retail consumers to EDCs	72,886	56,024	77%	79,324	69,766	88%	76,506	68,415	89%	72,424	58,494	81%
EDCs to Armenergo	74,714	41,055	55%	70,383	58,539	83%	65,410	45,188	69%	61,932	41,229	67%
Armenergo to Gencos	62,550	36,302	58%	68,465	42,768	62%	67,534	47,155	70%	66,700	34,685	52%
Export consumers to Armenergo	2,985	1,666	56%	4,436	1,482	33%	5,829	6,630	114%	3,906	3,877	99%
Gencos to Armenergo (economic needs)	213	201	95%	261	264	101%	383	239	62%	669	460	69%

Table 14. Retail operations by customer groups, mln. dram (incl. VAT)

	1998	1999	2000	2001
Total accrued income	72,886	79,324	76,506	72,424
Residential	27,907	31,901	30,738	29,422
Industrial	12,336	12,419	12,161	12,434
Transportation	2,778	2,233	2,089	2,017
Irrigation	7,093	9,378	9,806	7,908
Drinking water	6,355	6,401	6,000	5,351
Budgetary organizations	5,871	5,661	5,710	5,592
Other consumers	10,548	11,331	10,001	9,700
Total collections	56,024	69,766	68,415	58,494
Residential	23,986	25,130	24,768	25,038
Industrial	11,474	14,094	11,359	10,161
Transportation	2,620	2,559	1,384	1,914
Irrigation	1,723	5,788	14,332	4,146
Drinking water	2,586	5,532	2,597	1,426
Budgetary organizations	4,526	4,821	4,421	4,210
Other consumers	9,111	11,842	9,554	11,597
Total collections as per cent of accrued income	77%	88%	89%	81%
Residential	86%	79%	81%	85%
Industrial	93%	113%	93%	82%
Transportation	94%	115%	66%	95%
Irrigation	24%	62%	146%	52%
Drinking water	41%	86%	43%	27%
Budgetary organizations	77%	85%	77%	75%
Other consumers	86%	105%	96%	120%

Table 15. Retail operations by EDCs, % collection of accrued income

	1998	1999	2000	2001
Yerevan EDC	91%	95%	87%	87%
Southern EDC	54%	98%	86%	79%
Central EDC	70%	70%	102%	67%
Northern EDC	86%	81%	79%	92%
Total	77%	88%	89%	81%

Table 16. Margins of EDCs and Armenergo, mln. drams

	1998		1999		2000		2001	
	Accrued margin	Cash margin	Accrued margin	Cash margin	Accrued margin	Cash margin	Accrued margin	Cash margin
EDCs	-1,828	14,969	8,941	11,228	11,096	23,227	10,492	17,264
Armenergo	15,362	6,621	6,615	17,517	4,089	4,903	-193	10,881

Table 17. Payments by EDCs to Armenergo

	1998	1999	2000	2001
Yerevan EDC	74%	87%	70%	68%
Southern EDC	39%	115%	72%	77%
Central EDC	39%	67%	55%	43%
Northern EDC	52%	46%	93%	102%
Total	55%	83%	69%	67%

Table 18. Payments by Armenergo to Gencos

	1998	1999	2000	2001
ANPP ²	46%	30%	49%	24%
Hrazdan TPP	59%	67%	71%	62%
Yerevan CHP	64%	132%	137%	87%
Sevan-Hrazdan HPP	122%	137%	63%	57%
Vorotan HPP	89%	49%	33%	27%
Dzora HPP				
Small HPPs	69%	79%	87%	64%
Total	58%	62%	70%	52%

² Not including payment for nuclear fuel.

APPENDIX D: FINANCIAL LOSSES

Table 19. Armenian electric energy sector financial losses arising from non-payment and excess line losses³

Formula	Item	1998	1999	2000	2001
1	Exchange rate, dram/\$	505	536	540	550
2=3-4	Non-payment, mln. \$ (incl. VAT)	33	18	15	25
3	Accrued income from domestic electricity sales, mln. \$	144	148	142	132
4	Collected income on the domestic market for electricity sales, mln. \$	111	130	127	106
5	Excess line losses at average retail tariff, mln. \$ (incl. VAT)	36	24	25	24
6=2+5	Total financial losses of the electric energy sector, mln. \$	69	42	40	49
7=2/6	Per cent non-payment in total financial losses, %	48%	43%	38%	51%
8=5/6	Per cent excess line losses in total financial losses, %	52%	57%	62%	49%
9=3+5	Potential sector's revenue, mln. \$ (incl. VAT)	180	172	167	156
10=6/9	Financial losses as per cent of sector's potential revenue, %	38%	24%	24%	32%

³ Not including electric energy export and thermal energy sales.